Transcranial Magnetic Stimulation (TMS): An Entirely Novel Form of Treatment in Psychiatry and a Groundbreaking Opportunity for Psychiatric Mental Health Nursing

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Advances in brain stimulation such as transcranial magnetic stimulation (TMS) represent exciting new frontiers at the interface of practice, research, and education in psychiatric–mental health nursing. Noninvasive, focal, therapeutic brain stimulation is a rapidly emerging field in psychiatry. TMS, approved by the US Food and Drug Administration in October 2008 for treatment of unipolar depression with one failed antidepressant treatment in the current episode, is a highly innovative treatment for treatment-resistant depression (TRD). This is a landmark opportunity for psychiatric–mental health nurses to play a critical role in shaping the clinical application of an entirely novel psychiatric treatment. It is a critical time to develop and give voice to the specialized knowledge, skill, and caring that ultimately answers the question, "Why do our patients deserve a psychiatric–mental health nurse?"

Brain stimulation in psychiatry treatment is a "back to the future" phenomenon. Having pioneered the idea of electromagnetic induction back in 1838, Faraday is the ideological ancestor of modern day TMS. In 1985, Barker provided the first noninvasive, safe, and painless means of activating the human cortex assessing integrity of central motor pathways (Kobayashi & Pascual-Leone, 2003). Since then, TMS has been used in clinical neurophysiology, neurology, neuroscience, and psychiatry as a diagnostic tool for mapping brain function, diagnosing brain abnormalities, and studying motor function

(Anderson et al., 2006). It is now being recognized as an extraordinary new direction for future psychiatric treatment.

TMS is a treatment that delivers magnetic pulses to the cortex using a stimulating coil placed directly on the head. It is noninvasive because magnetic pulses pass unimpeded through the skull. TMS is based on two electromagnetic principles: (a) a magnetic field is generated using an alternating electric current (Ampere's law) and (b) an electric current is generated using an alternating magnetic field (Faraday's law; Burt, Lisanby, & Sackeim, 2002). In TMS treatment, these two principles are enacted sequentially. After the insulated metal coil is placed on the patient's head, rapidly changing magnetic fields are generated by alternating electrical current in the coil. Using a stimulator to control frequency and intensity, the

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focused magnetic pulses induce electric currents in focal regions of the cortex, thus depolarizing neurons and exerting transsynaptic effects at connected regions (Burt, Lisanby, & Sackeim, 2002; Lisanby, 2004). Neuronal depolarization leads to increased secretion of growth factors such as brain derived neurotrophic factor that some studies have associated with neuronal sprouting, reorganization, and, potentially, neurogenesis (Wassermann & Lisanby, 2001). Rapidly repeating trains of magnetic pulses (rTMS) using a stimulation frequency of 10 Hz (fast-frequency rTMS) over the dorsolateral prefrontal cortex (DLPFC) or 1 Hz (slow rTMS) over the right DLPFC have demonstrated antidepressant efficacy (Burt, Lisanby, & Sackeim, 2002; Kozel & George, 2002).

Although electroconvulsive therapy (ECT) remains the treatment of choice for severe TRD, developments in the rapidly evolving field of brain stimulation signal critically important efforts at personalizing the treatment of TRD to optimize outcomes and improve treatment tolerability. This is vital because major depressive disorder affects approximately 14 million Americans (Kessler et al., 2005), and the World Health Organization (2001) estimates that by 2020 depression will be the second most common cause of disability worldwide. TRD has begun to receive increased attention because antidepressants fail to effectively treat a substantial proportion of patients (Rush et al., 2006). New therapeutic approaches such as TMS spare the side effects associated with medication and help patients who are not adequately helped by medication. For TRD patients, depression is often chronic, lifelong, and disabling and represents a significant source of suffering, disruption in role functioning, economic burden to society, and mortality (Gaynes et al., 2008). There is great need to identify individualized treatment approaches that optimally sequence and combine the best strategies from antidepressant medications, evidence-based psychotherapies such as cognitive behavioral therapy, and brain stimulation modalities such as TMS.

This is an auspicious time for a special issue on TMS in the nursing literature. Psychiatric nurses at all levels of practice are poised to develop innovative clinical programs and contribute to interdisciplinary programs of research that will transform nursing science and neuroscience and inform the development of psychiatric best practices across the globe. This special issue of the *Journal of the American Psychiatric Nurses Association* highlights many of the groundbreaking contributions that psychiatric nurses are making in the pioneering field of brain stimulation and, specifically, TMS.

As research reveals new avenues of less invasive techniques for stimulating the brain, it is vital to recognize the psychiatric mental health nursing perspective on mental health care. Psychiatric nurses administer TMS treatments; at the advanced practice level, they will prescribe TMS. However, the patient's perceptions of treatment remain fundamental to both the acceptance of the treatment and its outcome. Nurses will continue to play a key role. They will manage a patient's health and illness; provide vital teaching and coaching; integrate the best evidence into patient-centered, culturally competent care; and ensure the quality of therapeutic practice, including the therapeutic milieu. In fact, it has never been more important to emphasize that the fundamental therapeutic component of psychiatric nursing is the nurse–patient relationship.

Neuroscientific advances pave the way for a new paradigm in psychiatry that integrates psychotherapy, pharmacological agents, and brain stimulation. In the past, psychiatric treatment has, at times, suffered from being viewed dichotomously and simplistically within a narrow psychological (mind) or biological (brain) frame rather than a holistic one. Emerging neuroscientific findings expose these false distinctions. Psychotherapy can now be understood as a biological treatment, a means of neural restructuring altering the cellular microanatomy of the brain and affecting cellular biological markers (Koch et al., 2009; Oldham & Riba, 2004; Wheeler, 2009). Treatments formerly labeled "biological" enhance self-awareness and capacity for behavioral change because cognitive, emotional, perceptual, and behavioral functions are mediated by specific areas of the brain and their associated neural connectivity (Peres & Nasello, 2008). Brain stimulation modalities such as TMS provide critical new dimensions to understanding what the brain does, how it regulates in health and illness, and how its functioning can be facilitated and modulated for therapeutic effect. Furthermore, TMS is a "biological" intervention that is administered in a psychological context, involving intensive daily contact between the psychiatric nurse and the patient. This special issue addresses the need to translate emerging technologies and knowledge in neuroscience at the clinical interface to rapidly influence the mental health outcomes of our patients and the policies that shape them.

The International Society for Neurostimulation (ISN), having recently elected me to a newly created nursing executive board position, will be consulting with the APA about treatment guidelines for rTMS in major depression. This is of critical importance as

these guidelines will affect access to treatment in the United States and around the world. ISN, formerly the Association for Convulsive Therapy, is a nonprofit organization composed of mental health professionals. Its mission is "To improve the lives of people with neurpsychiatric illness by promoting excellence in the use of ECT and related CNS stimulation treatments," and its vision is "To become the organization most recognized for improving the quality and image of ECT and related CNS stimulation treatments worldwide." Its members seek to achieve these goals through research and scientific exchange, education and training, and improved public awareness.

In my role at ISN, I will seek opportunities to reach a wider audience and interact with clinicians from around the world, including psychiatric nurses at basic and advanced practice levels, interdisciplinary psychiatric colleagues, primary care practitioners, and specialists. I have contacted the National Association of Lead Nurses for Electroconvulsive Therapy, an England-based organization, to collaborate on ideas for professional development, networking, and mentoring nationally and internationally. With colleagues, I created a blog for psychiatric nurses to engage in dialogue about education, role development, and interdisciplinary research: http://www.tms-nurses.org/blog/. To translate research to the clinical interface, we will need to develop new synergies between ISN and American Psychiatric Nurses Association (APNA), promoting educational initiatives, and mentoring of clinicians and clinical faculty. The therapeutic potential and professional roles in brain stimulation are vast. However, as techniques are increasingly adopted worldwide, the application of evidence-based practice will grow to become more challenging. ISN is at the forefront of international, interdisciplinary efforts that advance teaching, research, and health care policy making in brain stimulation. The active participation of Psychiatric–Mental Health Nursing is vital because we share the conviction that culturally sensitive, interdisciplinary efforts are needed to address international mental health needs.

Advocacy by the APNA and the dissemination of new knowledge through this groundbreaking edition of the *Journal of the American Psychiatric Nurses Association* has the potential to transform mental health practice, policy, reimbursement decision making, and research funding. As rTMS gains popularity in clinical and research settings, optimizing techniques for effective and safe dosing will become increasingly important. Currently, rTMS dose is calibrated to cortical excitability, a measure referred to as the motor threshold. Anderson conducts the first systematic review comparing observation of movement (OM) with EMG-assisted methods. In a key contribution to the advancement of rTMS, he summarizes the empirical evidence, makes recommendations for determining MT, and points out areas for needed research. Fitzpatrick, Disner, and Bress provide an excellent overview of the certified psychiatric nurse's (CPN) role in rTMS paying particular attention to the authority, accuracy, and verifiability CPNs bring to the role of clinical rater in research. Exploring future directions of rTMS, they summarize evidence on magnetic seizure therapy (MST), the application of TMS at high frequencies to induce therapeutic seizures. MST is under clinical investigation as a potential treatment for more severe TRD. This landmark issue marks the introduction of MST into the nursing literature. Bernard et al. discusses current practice guidelines, psychiatric nursing qualifications, and essential details about developing an rTMS clinical service. This important clinical article is the first to describe the role of a psychiatric nurse in establishing a clinical rTMS service, administering rTMS, and helping patients undergo the treatment. Finally, Rosedale, Lisanby, and Malaspina contribute a research brief describing the lived experience of patients who received rTMS treatment for depression. This phenomenological study uniquely explores the patient perspective on TMS. It illuminates the narrative of frustration and helplessness with medication treatment resistance, the sensory experience of TMS, mindfulness—an enhanced awareness of the content of consciousness, and the importance of connection. Importantly, as we explore and develop knowledge in the field of brain stimulation, the study offers a new way of understanding the human experience. The cost of depression and relapse of these vulnerable patients, their families, communities, and to society is unacceptably high. This special edition reminds us that solving this problem will require a new integrative, pluralistic approach connecting brain and mind, embracing interdisciplinary collaboration, and valuing quantitative and qualitative approaches to knowledge generation.

Nursing is commonly described as both a science and an art. Whether determining the motor threshold, administering TMS, conducting clinical ratings, or acting as a patient liaison and advocate, psychiatric nurses are engaged in understanding and integrating the diverse factors that enhance or impede a patient's health. This requires adoption of a broad psychosocial framework that is unique to

nursing. In particular, we must understand the patient through the therapeutic relationship we share and appreciate the patient as a member of a family, community, and larger social, cultural, and economic environment.

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